Pennsylvania Coastal Zone Management Program

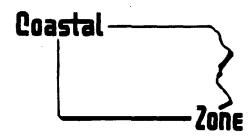
1993 Presque Isle Exotic Plant Species Control Project: Restoration of Lithospermum caroliniense and Scirpus smithii

December, 1993

SPC # 226290 CZ1:92.04PS

A Report of the Pennsylvania Department of Environmental Resources to The National Oceanic and Atmospheric Administration Pursuant to NOAA Award No. NA 27Z0335-01







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ACKNOWLEDGEMENTS

Special acknowledgement goes to Kathleen McKenna, Bureau of Forestry for helping to develop the plan for the 1993 phase of the Lithospermum caroliniense restoration project and Scirpus smithii project. She also worked to secure funding for the project. Funding for this project was received from the Wild Resources Conservation Fund and Pennsylvania Coastal Zone Mnagement Program, Division of Coastal Zone Management, Pennsylvania Department of Environmental Resources.

Thanks go to Adjunct Curator of Botany Beverly Danielson who volunteered seven days of work on the project and Norma Kline who volunteered two days of work.

Thanks go to Cleveland Heights High School teacher Blair Chirdon and seven of his students who helped pull out a 20 by 15 foot meadow of Phragmites australis and Typha glauca on March 26.

Thanks go to Mercyhurst College Professor Michael Campbell and his students Katy Covin and Akrom Alzught who helped to establish and collect base line data from ten 10 by 10 foot plots at the Lithospermum caroliniense site.

Special thanks are given to Museum Botany Department Interns Heather Chirdon, Matthew Collier and Steven Meiers who set up the Scirpus smithii belt transect and pulled Lythrum salicaria and Epilobium hirsutum from a 25 by 35 meter area adjacent to the Scirpus smithii control plot. They also collected baseline data from the only park location of Geranium bicknellii. Removal of exotics and common weedy plants from the site is planned for 1994. Geranium bicknellii has not been seen at the site since 1986 but seeds are presumed to be present in the soil. Removal of vegetation at the site in 1994 may trigger release of the rare geranium from the seed bank.

geranium from the seed bank.

Thanks are given to Park Superintendent Harry Leslie and Assistent Superintendents Obediah Derr and Peter Houghton for giving advice and assistance throughout the study and special thanks go to Superintendent Leslie go giving permission to begin the Geranium bicknellii restoration project.

METHODS

In consultation with Kathleen McKenna, Professor Michael Campbell of Mercyhurst College and Adjunct Curator of Botany Beverly Danielson, plans were developed for renewal and exansion of two of the 1991 exotic control projects. One of the projects entailed the removal of Lythrum salicaria, Epilobium hirsutum, Typha X glauca, Phragmites and Phalaris arundinacea from the 1991 Scirpus smithii site. The other project involved the collecting data from two Lonicera morrowi removal areas within the Lithospermum caroliniense dry sand plain along the south side of PA Rt. 832 east of the Light House. Park Maintenance staff removed the Lonnicera morrowi from the two areas in 1991. A second phase of the puccoon study involved establishing five sets of 10 foot by 10 foot plots within the dry sand plain south of PA Rt. 832 and east of the Light House. Each of the five sets included one plot that was mowed regularly from mid to late summer and one plot where the soil was turned over in mid-summer.

On March 26, seven students from an environmental club at Cleveland Heights High School assisted with removal of hairy hillow herb (Epilobium hirsutum) and purple loosestrife (Lythrum salicaria from the 1991 Scirpus smithii study area. The students, Adjunct Curator Beverly Danielson and Curator James Bissell also removed a 20 by 15 foot meadow of Phragmites australis and Typha x glauca that establish within the northeast corner of the 1991 study area during the 1992 field season. On April 24, permanent 3 foot by 3 foot sample plots were established within the 1991 study area and percentage cover was recorded by the permanent plots. The numbered plots within the 1991 study area (#1 through #5) are shown on Appendix 2. The plots within the 1991 study area were sampled again on September 27.

On May 15, an expansion of the 1991 study area was made by removing sandbar willow (Salix exigua) along with a relatively solid cover of purple loosestrife and hairy willow herb. This expansion is called the Scirpus smithii control plot expansion and is shown on Appendix 2 as the area to the south of the belt transect bounded by sample plots numbered 6 through 10. Prior to removal of the exotics, percentage cover quadrat analyses was collected from each of the five sample plots and these plots were sampled again on September 27.

On May 15, a different method of palustrine sand plain restoration was also initiated. A 10 by 10 foot section of wet flats, heavily vegetated with purple loosestrife, hairy willow herb and blue joint reed-grass (Calamagrostis canadensis) was turned over. The northern edge of the turnover plot is 40 feet south of the southern edge of the Scirpus smithii plot. Percentage cover data was taken from five sample plots within the turned over area. The turned over area was clipped to within

four inches of the ground at three week intervals and sampled on September 27.

All percentage cover data collected, both prior and after to removal of exotics and is included within the appendix of this report. In addition, the location of all POSCIP plants within the 100 by 35 foot Scirpus smithii exotic control plot is shown by a series of maps within the Appendix.

On June 14, a census of the hairy puccoon was taken within the sand plain habitat along the south side of PA Rt. 832 to the east of the Presque Isle Light House. In addition to counting the puccoons, the two areas where Lonicera morrowi were removed in 1991 were examined to determine whether any Plants of Special Concern in Pennsylvani have established since removal of the exotic shrubs.

On June 29, five sets of two 10 by 10 foot quadrats were established within the hairy puccoon sand plain east of the Light House and south of PA Rt. 832. At each of the five treatment sites the eastern plot was designated as an area to be rototilled and the western plot was designated as an area to be mowed. Percentage cover data within all the plots was collected on June 29. Volunteers Katy Covin and Akrom Alzught mowed all ten plots on July 15 and Akrom Alzught rototilled and again on September 8.

FIELD SCHEDULE

for

1993 PRESQUE ISLE STATE PARK EXOTIC SPECIES MANAGEMENT PROJECT CONTRACT NUMBER SP 101727

March 26	Exotic species removal from <u>Scirpus smithii</u> site.
April 24	Continue removal from Smiths's bulrush site.
May 15	Extend exotic species removal area at Smith's bulrush site and collect percentage cover data.
June 14	Census <u>Lithospermum caroliniense</u> population and inventory for POSCIP species at areas where <u>Lonicera morrowi</u> was removed in 1991.
June 23	Inventory for POSCIP species at both management areas and removal from exotic species from both areas.
June 29	Establish sites for quadrats where soil will be turned over and regular mowing will be done.
July 9	All puccoon 10 ft. test plots were mowed by volunteers Katy Covin and Akrom Alzught.
July 15	Volunteer Akrom Alzught rototilled five of the puccoon test plots.
July 24	Lythrum salicaria seedlings were weeded from Smith's bulrush site.
July 26	Remove <u>Lonicera morrowi</u> seedlings from puccoon quadrats.
August 6	Establish site for belt transect across the Smith's bulrush exotic control plot.
August 16	Museum interns Matthew Collier, Heather Chirdon and Steve Meiers set up Smith's bulrush belt transect.
August 17	Interns work on belt transect.
August 18	Interns work on belt transect.
August 19	Interns finish belt transect.
August 30	Hand pulling of Phalaris arundinacea and

1993 Field Schedule (continued)

Lythrum salicaria seedlings from Smith's bulrush control plot.

September 8

Collection of percentage cover from soil turnover plots at puccoon site and collection of puccoon seed.

September 27

Collection of percentage cover data from quadrats in Smith's bulrush control plot and interior soil turnover plot; mapping of POSCIP species in Smith's bulrush control plot.

RESULTS

Scirpus smithii Exotic Control Project and Inerior Soil Turnover Project.

Three Scirpus smithii and several other POSCIP plants responded positively to the succession release conditions within the 100 by 35 foot area cleared of exotic species. The relatively high levels of Lake Erie during the study probably account for the low numbers of some of the POSCIP species found within the control plot. The lake remained at relatively high levels until middle summer and did not undergo a signficant decrease during May to July. Stable lake levels during the first half of the summer were observed in 1989 to inhibit germination of many rare plants that inhabitat the palustrine sand plain community and this same paucity of germination was observed throughout palustrine sand plains at Presque Isle during 1993. Plants of Special Concern in PA, in addition to Scirpus smithii, that resonded favorably to removal of exotics within the 35 by 100 foot control plot include:

Carex aquatilis
Carex bebbii
Cyperus diandrus
Cyperus odoratus
Eleocharis olivacea
Juncus balticus
Panicum tuckermanii
Potentilla anserina

As in 1991, with the exception of Potentilla anserina, all of the above POSCIP plants were rare or absent within the unweeded areas along the belt transect east and west of the control area. Two POSCIP species not observed in the study area in 1991 were found within the Scirpus smithii Control Plot Expansion following the removal of exotics:

Carex bebbii Cyperus diandrus

The following typical members of the palustrine sand plain community also responded positively to succession release within the Scirpus smithii control plot:

Cyperus bipartitus Cyperus flavescens Cyperus odoratus Cyperus strigosus Juncus nodosus Polygonum punctatum Scirpus americanus Interior Soil Turnover Plot:

Within the soil turnover area located 40 feet south of the Scirpus smithii Control Plot, only three POSCIP species responded to the succession release that resulted from turning over the soil and none of these POSCIP plants were present in the dense meadows adjacent to the turnover plot:

Carex bebbii (single plant in north central section of plot and not located in sample quadrats)

Cyperus odoratus (found in sample quadrats)
Polygonum amphibium var. stipulaceum (found in sample quadrats)

Several plants in addition to the POSCIP species listed above reponded to release from the seed bank as a result of turning over the soil. The realeased plants listed below were either rare or not found in the dense vegetation adjacent to the turnover plot:

Alisma subcordatum
Bidens cernua
Cyperus poeformis
Cyperus strigosus
Eupatorium perfoliatum
Lindernia dubia
Ludwigia palustris
Polygonum punctatum
Ranunculus scleratus
Rorippa islandica
Verbena hastata

Lithospermum caroliniense Restoration Project:

A total of 45 Lithospermum caroliniense plants were counted within the dry sand plain along the south side of PA Rt. 832 east of the Light House.

Several Plants of Special Concern in PA responded positively to mowing and/or rototilling within the 10 by 10 foot plots. Three POSCIP species showed great reponse to both treatments within more than one of the plots:

Cyperus schweinitzii Schizachyrium scoparium var. littorale Sporobolus cryptandrus

An additional POSCIP plant, Panicum commonsianum, was found to be present within mowed plot number 4a and was not observed there prior to the mowing.

Eastern Loncera morrowi pull-out site:

Two POSCIP plants were found within the 35 by 25 foot area at the eastern edge of study area where a dense thicket of Lonicera morrowi was pulled out in 1991:

Cyperus schweinitzii Sporobolus cryptandrus

Three POSCIP plants were found within the eastern 15 by 15 foot area where Lonicera morrowi was pulled by park staff in 1991:

Cyperus schweinitzii Panicum commonsianum Sporobolus cryptandrus APPENDIX

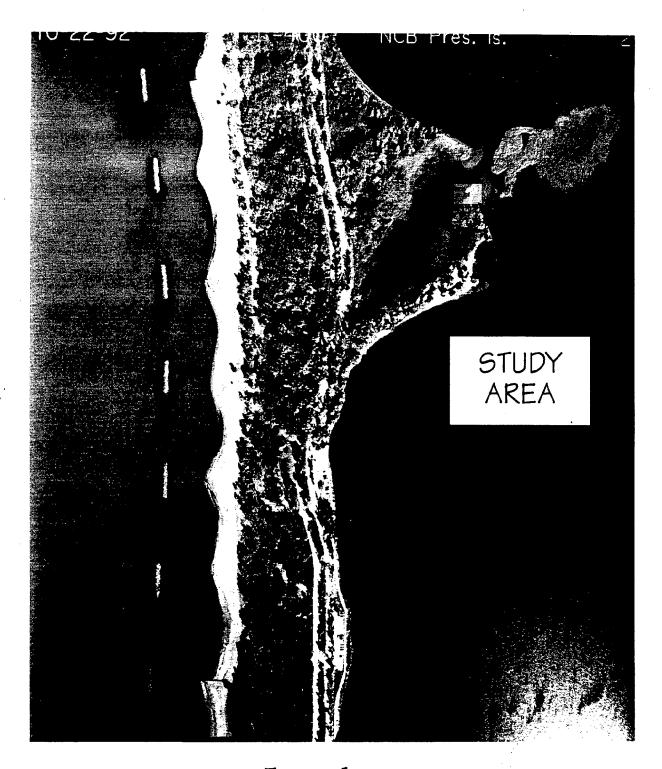
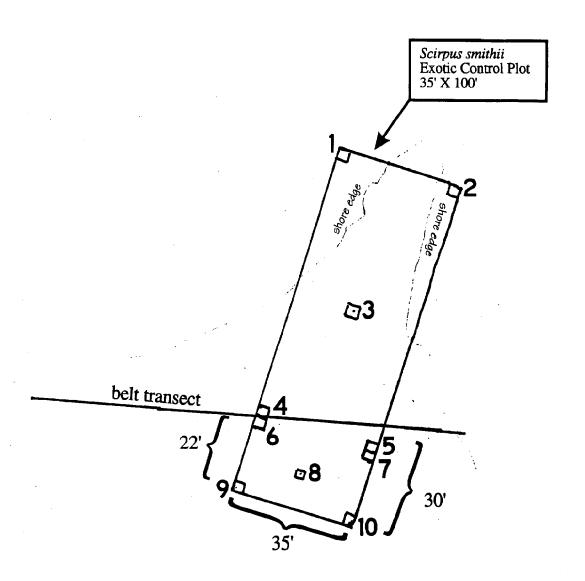
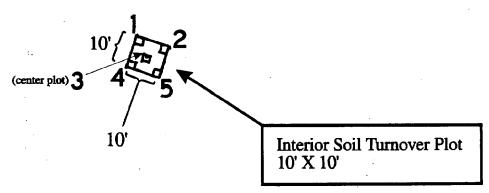


Figure 1
Scirpus smithii Exotic Control Study





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Figure *2

11,

Mean Monthly Lake Erie Levels 1993

March572.67 f	eet
April573.16 f	eet
May573.16 f	eet
May573.06 f	eet
June573,06 f	eet
July573 feet	•
August572.64 f	eet
September572.28 f	eet
October571.92 f	eet
November571.72 f	eet

Percentage Cover

of

Five

3 by 3 foot quadrats

within

1991 Scirpus smithii exotic control area April 24, 1993

% cover

Plot #1 (Northwest corner of 1991 control plot)

Open water

100%

Plot #2 (Northeast corner of 1991 control plot)

Open water

100%

Plot #3 (Center of 78 by 35 foot plot)

Phalaris arundinacea Typha X glauca

10%

30%

Phragmites australis

60%

Plot #4 (Southwest corner of 78 by 35 foot plot)

Bare sand

100%

Plot #5 (Southwest corner of 78 by 35 foot plot)

Phalaris arundinacea

50%

Typha X glauca

40왕

Bare sand

10왕

PERCENTAGE COVER

of

Five

3 by 3 foot quadrats

within

1991 Scirpus smithii exotic control area September 27, 1993

Plot #1 (Northwest corner of 1991 exotic control area)

Ceratophyllum demersum	3%
Nymphaea odorata	25%
Sagittaria rigida	3%
Vallisneria americana	10%
Bare sand (sumbmersed)	60%

Plot #2 (Northeast corner of 1991 exotic control area)

Potamogeton	richardsonii	2%
Vallisneria	americana	3%
Bare sand (s	submersed)	95%

Plot #3 (Center of 1991 exotic control area)

Scirpus americanus 5% Bare sand 95%

Plot #4 (Southwest corner of 1991 exotic control area)

Cyperus bipartitus	3%
Cyperus odoratus	3%
Lythrum salicaria	3%
Myriophyllum spicatum	1%
Polygonum lapathifolium	2%
Ranunculus longirostris	2%
Scirpus americanus	4%
Scirpus fluviatilis (seedling)	1%
Sparganium eurycarpum	3%

Plot #5 (Southeast corner of 1991 exotic control area)

Phalaris arundinacea	2%
Scirpus americanus	3%
Bare sand	95%

PERCENTAGE COVER of Scirpus smithii CONTROL PLOT EXPANSION 14 May 1993

Plot	Calamagrostis canadensis Epilobium hirsutum	by 35 feet expansion) are 3 X 3 feet. cover 30% 4% 3% 10%
Plot	#7 (Northeast corner of 22 by 35 Calamagrostis canadensis Epilobium hirsutum Lythrum salicaria Salix exigua	feet expansion) 45% 15% 5% 9%
Plot	#8 (Center of 22 by 35 feet exp Calamagrostis canadensis Epilobium hirsutum Lythrum salicaria Salix exigua	pansion) 40% 10% 5% 7%
Plot	#9 (Southwest corner of 22 by 3 Calamagrostis canadensis Epilobium hirsutum Lythrum salicaria Salix exigua	35 feet expansion) 50% 2% 1% 5%
Plot	#10 (Southeast corner of 22 by Calamagrostis canadensis Epilobium hirsutum Lythrum salicaria Salix exigua	y 35 feet expansion) 45% 5% 3% 3%
_		

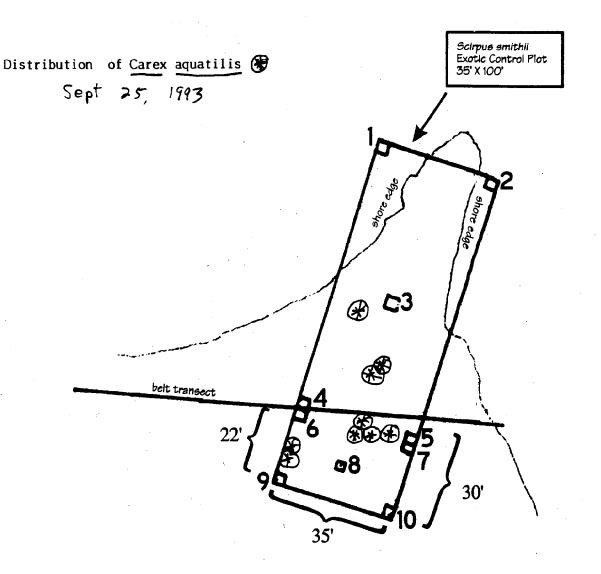
Average Percentage Cover for four dominant species within plots 6 through 10:

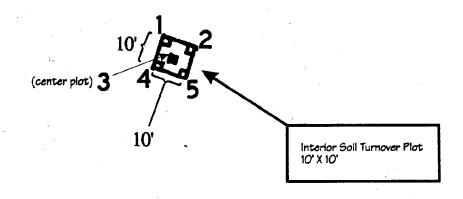
Calamagrostis canadensis	42%
Epilobium hirsutum	7.2%
Lythrum salicaria	3.4%
Salix exigua	6.8%

Percentage Cover of

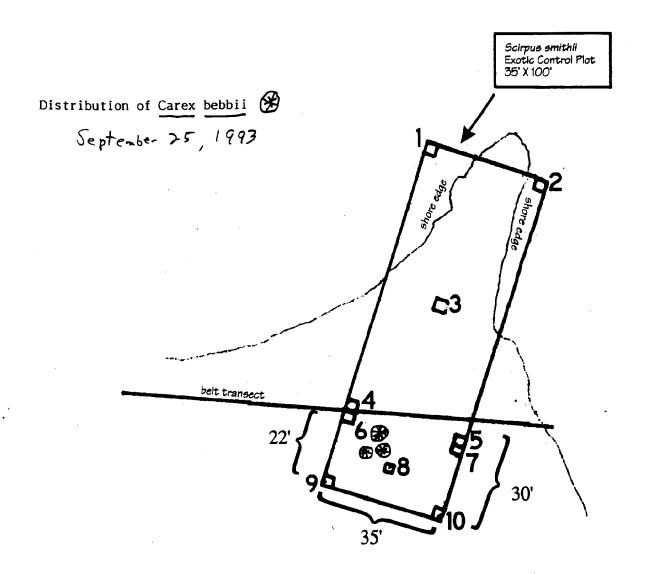
Scirpus smithii CONTROL PLOT EXPANSION 27 September 1993

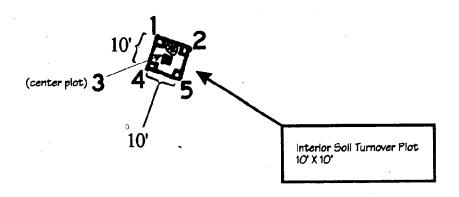
Plot	#6 (Northwest corner of 22 by 35 foot expansion)
	Butomus umbellatus 2% Eleocharis smallii 3% Leersia oryzoides 2% Lythrum salicaria 3% Ranunculus longirostis 2% Sparganium eurycarpum 20% Bare sand 60%
Plot	#7 (Northest corner of 22 by 35 foot expansion)
	Cyperus strigosus 2% Epilobium hirsutum 3% Lycopus americanus 3% Lythrum salicaria 2% Phalaris arundinacea 5% Polygonum punctatum 2% Scirpus americanus 8% Bare sand 80%
Plot	#8 (Center of 22 by 35 foot expansion)
	Calamagrostis canadensis Lythrum salicaria Sagittaria latifolia Salix exigua Scirpus americanus Sparganium eurycarpum Bare sand 35% 28 28 28 50%
Plot	#9 (Southwest corner of 22 by 35 foot expansion)
	Eleocharis smallii 2% Lythrum salicaria 2% Pontederia cordata 1% Sagittaria latifolia 1% Scirpus americanus 3% Sparganium eurycarpum 2% Bare Sand 90%





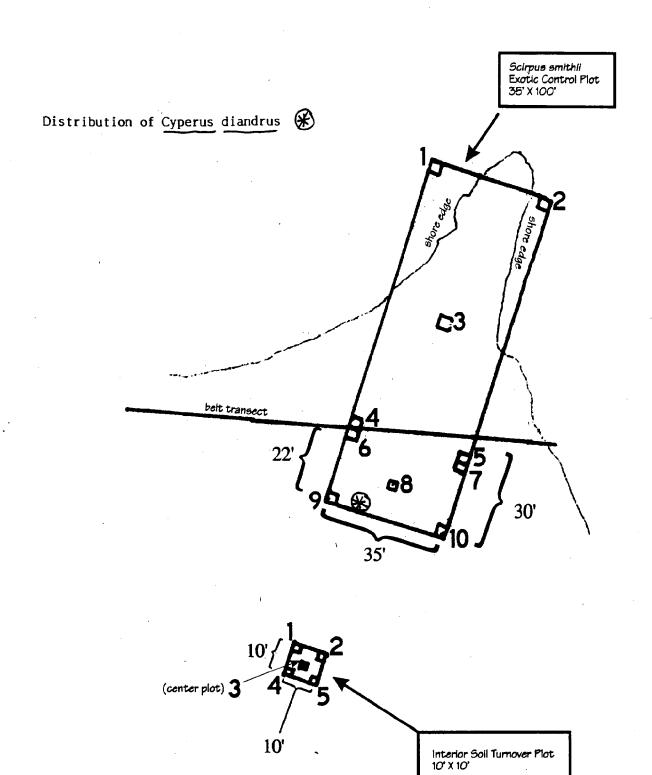
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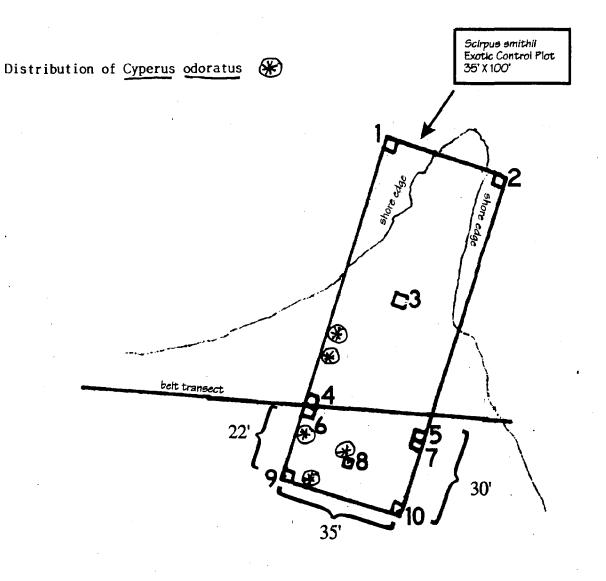
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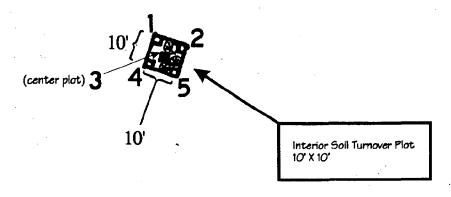
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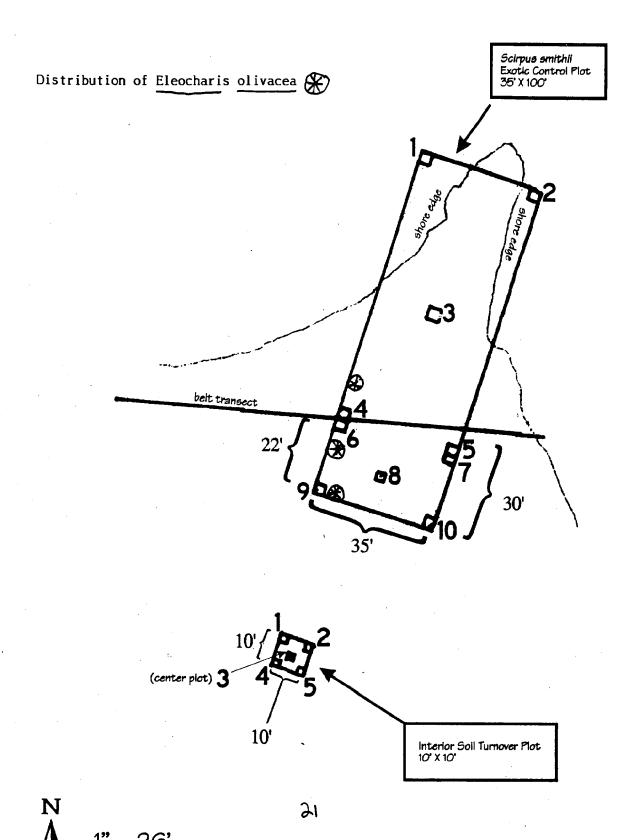


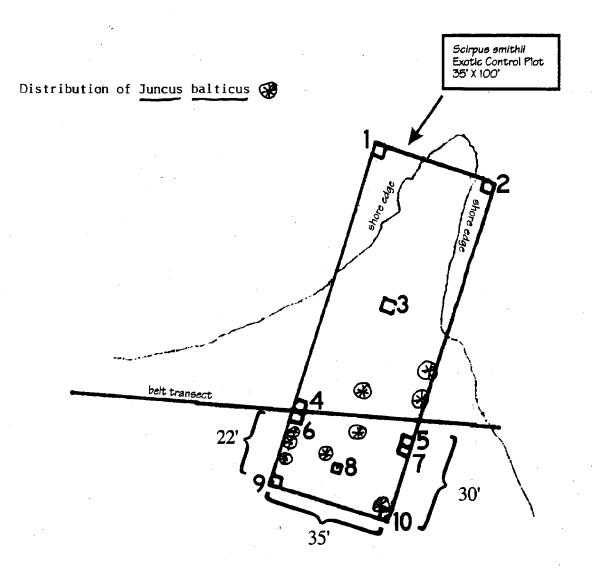


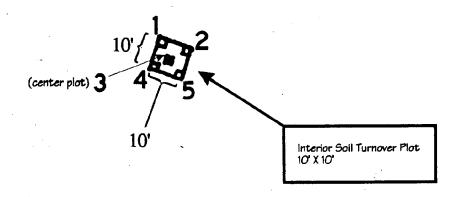
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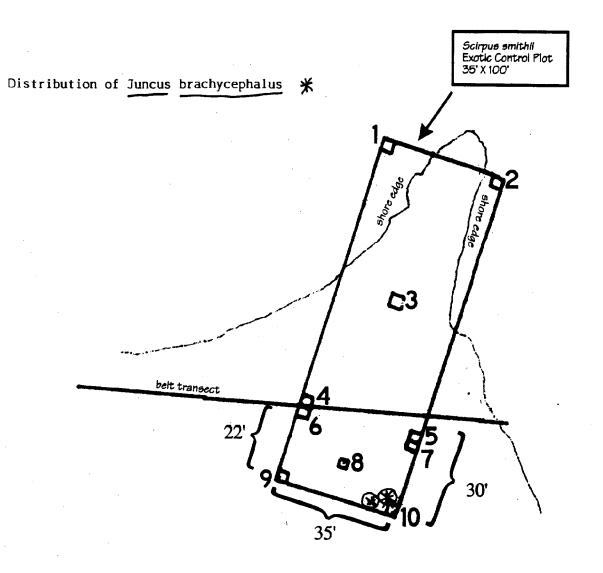


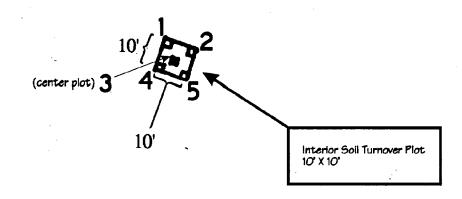




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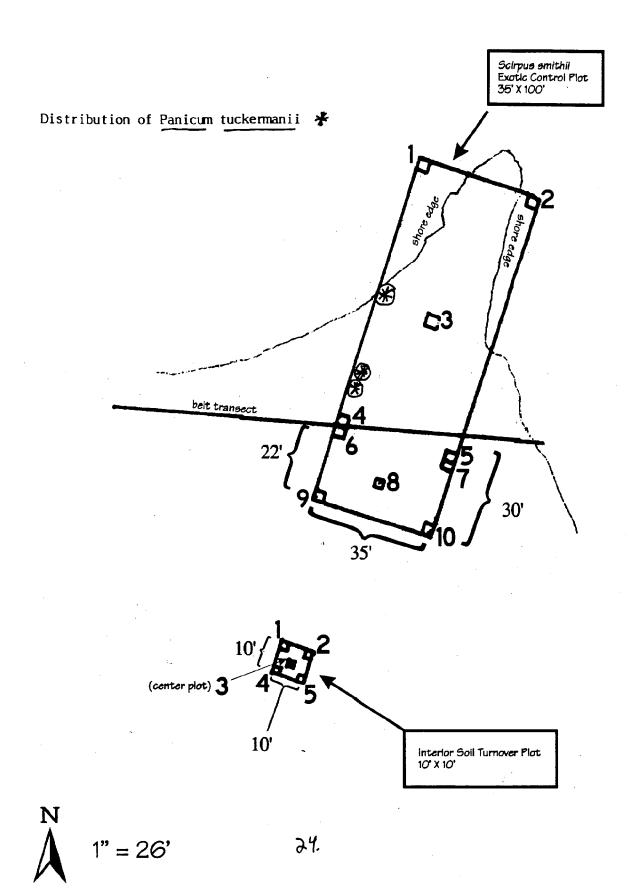


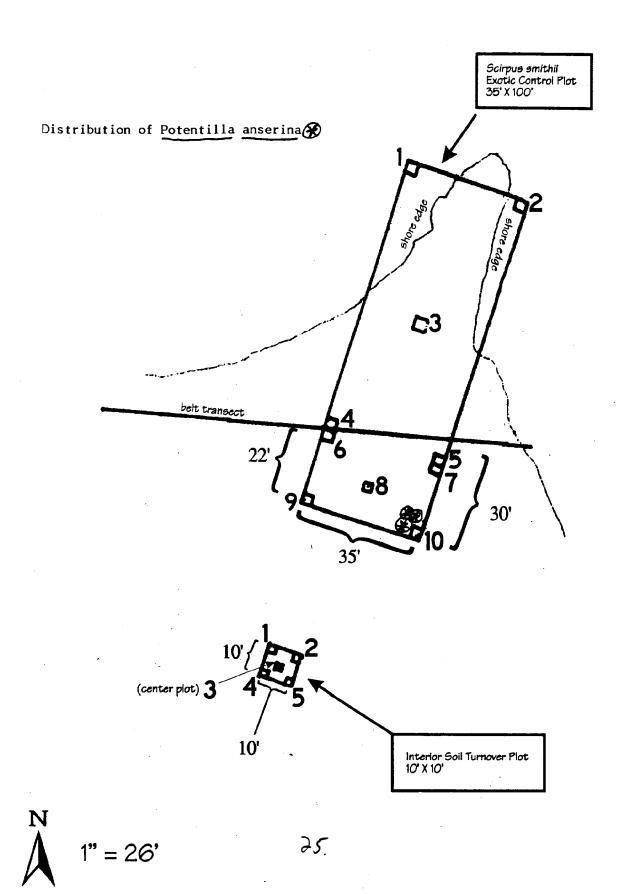


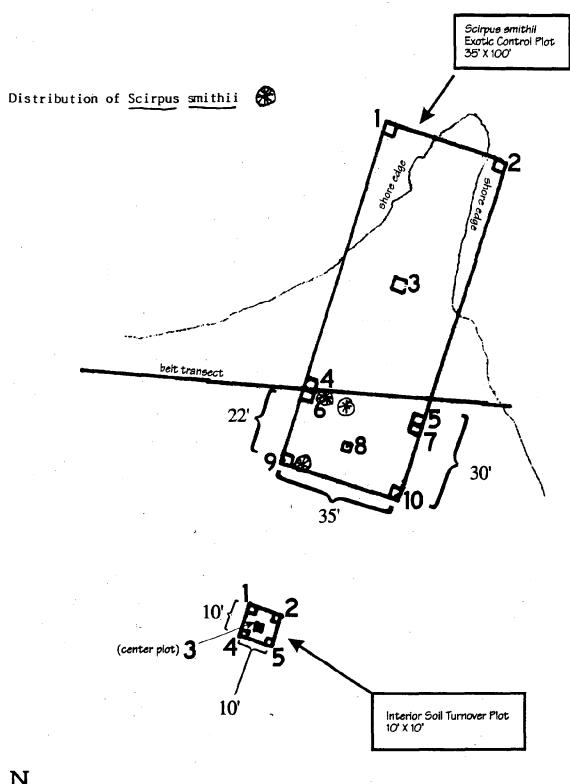
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1" = 26

23









1" = 26'

76

Scirpus Smithii Belt Transect

by Heather M. Chirdon, Matthew H. Collier, Claudia Eggers and Stephen R. Meyers

August 1993

INTRODUCTION

Purple loosestrife (Lythrum salicaria) is an invasive plant that takes over wetlands, choking out all native vegetation. Though it has been present on Presque Isle for a number of years, until recently, its impact has been minimal. In the area studied the Lythrum is spreading and its detrimental effects are of concern to Presque Isle State Park and the Cleveland Museum of Natural History. The purpose of this study is to establish baseline data in an area containing the invasive Lythrum. It is hoped that this study will aid in understanding the effects of Lythrum upon native plant communities, both before and after its removal.

METHODS

A belt transect was used to sample an area which had been previously eradicated of Lythrum. The transect was 40 meters in length, beginning and ending in areas of open water. Wooden stakes were placed one meter apart at each end and two lengths of string, each 40 meters long, were tied to them. The transect was divided into forty 1 meter squares. All plants in each square meter were identified and "percent coverage" was estimated.

RESULTS

Table 1: Percent Coverage and Plant Species Found in Transect

	Species		% Cover
1.	Scirpus tabernaemontani	100%	
2.	Lythrum salicaria	25%	
	Typha x galuca	108	
	Scirpus americanus	28	
	Scripus tabernaemontani	638	
3.	Scirpus tabernaemontani	47%	
	Lythrum salicaria	308	
	Typha x glauca	108	
	Solanum dulcamara	5%	
	Scirpus americanus	5%	
	Lycopus virginicus	28	
	Salix exigua var. interior	18	
4.	Scirpus tabernaemontani	78	
	Lythrum salicaria	308	
	Sailx exigua var. interior	18	
	Nymphaea odorata	18	
	Scirpus americanus	208	•
	Typha x glauca	408	
	Calamagrostis spp.	18	
5.	Lycopus virginicus	40%	
	Scirpus americanus	108	
	Epilobium hirsutum	108	
	Scirpus tabernaemontani	5 %	
	Calamagrostis spp.	5%	
	Leersia oryzoides	58	
	Typha x glauca	5%	
	Lythrum salicaria	20%	
6.	Scirpus americanus	20%	
	Lycopus virginicus	50 %	
	Lythrum salicaria	5%	
	Calamagrostis spp.	208	
	Leersia oryzoides	5%	,
7.	Scirpus americanus	100%	. •
8.	Scirpus americanus	928	
	Typha x glauca	48	
	Calamagrostis spp.	38	
	Lythrum salicaria	18	•
	Juncus balticus	18	

				•	
				•	
	۵	Cairpus amorisanus	208		
	9.	Scirpus americanus Scirpus tabernaemontani	20왕 7왕		
		Typha x glauca	5 %		
		Carex aquatilis	30%		
		Juncus balticus	38		
		Sparganium eurycarpum	35%	,	
	10	Sparganium eurycarpum	30%		
	10.	Carex aquatilis	25%		
		Scirpus tabernaemontani	5%	•	
*		Scirpus americanus	108		
		Juncus balticus	3%		
		Juncus brachycephalus	5 <i></i> *		
		Carex spp.	18		
		Sagittaria latifolia	5%		
•		Nymphaea odorata	18		
		Lythrum salicaria	15%		
	11.	Scirpus americanus	15%		
•		Scirpus tabernaemontani	38		
		Sparganium eurycarpum	50%		
		Juncus balticus	10%		
		Juncus brachycephalus	5%		
•	•	Juncus nodosus	18		
		Carex aquatilis	10% 5%		
·		Lythrum salicaria Eleocharis smallii	18		
		Eleocharis smalli	7.9		
	12.	Sagittaria latifolia	108		
		Sparganium eurycarpum	75%		
		Lythrum salicaria	58	•	
		Scirpus americanus	10%		
	13.	Sparganium eurycarpum	708		
		Scirpus americanus	208		
		Alisma triviale	10%		•
	14.	Sparganium eurycarpum	75%		
	*	Lythrum salicaria	5%		
		Calamagrostis spp.	10%		
		Eleocharis smallii	10%		
	15.	Nymphaea odorata	32%		
-		Scirpus americanus	5 %		•
		Salix exigua var. interior	5%		
		Sagittaria latifolia	58	4	
		Sparganium eurycarpum	438 = 2		
•		Lythrum salicaria	5 % 5 %		
		Eleocharis smallii	·		

16.	Sparganium eurycarpum Scirpus americanus Pontederia cordata Nymphaea odorata Carex aquatilis Sagittaria latifolia	20% 25% 30% 15% 5% 5%
17.	Butomus umbellatus Sagittaria latifolia Pontederia cordata Nymphaea odorata Scirpus americanus Sparganium eurycarpum Lythrum salicaria	5% 30% 35% 2% 2% 25% 1%
18.	Pontederia cordata Sparganium eurycarpum Sagittaria latifolia Scirpus americanus	70% 24% 5% 1%
19.	Sparganium eurycarpum Pontederia cordata Sagittaria latifolia	35% 60% 5%
20.	Pontederia cordata Sagittaria latifolia Sparganium eurycarpum Nymphaea odorata	35% 5% 35% 25%
21.	Pontederia cordata Sagittaria latifolia Sparganium eurycarpum Nymphaea odorata	25% 5% 65% 5%
22.	Pontederia cordata Sagittaria latifolia Sparganium eurycarpum Nymphaea odorata	14% 25% 60% 1%
23.	Sparganium eurycarpum Sagittaria latifolia Pontederia cordata	75% 15% 10%
24.	Scirpus taberneamontani Sparganium eurycarpum Sagittaria latifolia Nymphaea odorata	10% 70% 10% 10%
25.	Sparganium eurycarpum Scirpus tabernaemontani Sagittaria latifolia Pontederia cordata	70% 15% 14% 1%

26.	Sparganium eurycarpum Pontederia cordata Sagittaria latifolia Scirpus tabernaemontani Nymphaea odorata	608 98 208 108 18
27.	Sagittaria latifolia Scirpus americanus	10용 5용
	Sparganium eurycarpum Scirpus tabernaemontani	80용 5용
28.	Sparganium eurycarpum Sagittaria latifolia Scirpus tabernaemontani	70% 15% 15%
29.	Sparganium eurycarpum Sagittaria latifolia Scirpus taberneamontani	70% 15% 15%
30.	Pontederia cordata Sagittaria latifolia Sparganium eurycarpum Scirpus taberneamontani	108 258 408 258
31.	Sparganium eurycarpum Sagittaria latifolia Nymphaea ordorata Pontederia cordata Scirpus tabernaemontani	658 78 58 38 208
32.	Sparganium eurycarpum Pontederia cordata Scirpus tabernaemontani Scirpus americanus Nymphaea odorata	70% 20% 1% 8% 1%
	Sparganium eurycarpum Pontederia cordata Sagittaria latifolia	85% 5% 10%
34.	Pontederia cordata Sparganium eurycarpum Sagittaria latifloia Scirpus americanus	5% 60% 15% 20%
35.	Nymphaea odorata Pontederia cordata Sparganium eurycarpum	25% 50% 25%
36.	Nymphaea odorata Sagittaria latifolia Sparganium eurycarpum Scirpus americanus	70% 20% 9% 1%

37.	Sparganium eurycarpum Nymphaea odorata Sagittaria latifolia Scirpus americanus	70% 6% 4% 20%
38.	Pontederia cordata Sparganium eurycarpum	18 998
39.	No vegetation	

DISCUSSION

40. No vegetation

After the data was collected, <u>Lythrum salicaria</u> was cleared from an area approximately 35 meters by 25 meters. Entire plants were removed, in an attempt to minimize possible resurgence of the loosestrife. This area will continue to be monitored to determine the success of this project.

ACKNOWLEDGMENTS

Special thanks to Jim Bissell for identifying unknown plants and getting us started on the project.

			I	Perce		ge Cov f	er	
			Inter	cior	3 f wit 10 urn	foot Q hin by 10 over F / 1993	foot	ts
Plot	#1	(Northwest	ern co	rner	of	turno	ver p	lot)
	Epil	magrostis (obium hirsu nrum salican	itum	nsis				30% 10% 30%
Plot	#2	(Northeaste	ern co	rner	of	turno	ver p	lot)
	Care Epil	magrostis o ex stricta obium hirsu rum salica	ıtum	nsis				20% 2% 5% 25%
Plot	#3	(Center of	turno	ver p	plot	:) .		
	Epil	magrostis o obium hirsu nrum salican	ıtum	nsis				60% 5% 20%
Plot	#4	(Southwest	corne	r of	tur	nover	plot)
	Epil	magrostis o obium hirsu arum salica	ıtum	nsis				20% 5% 30%
Plot	#5	(Southeast	corne	r of	tur	nover	plot)
	Care	magrostis o		nsis				25% 3%

PERCENTAGE COVER of FIVE 3 by 3 foot Quadrats within 10 by 10 Foot Interior Soil Turnover Plot

September 27, 1993

Plot	#1 (Northwest corner of Turnover	Plot)
	Alisma subcordatum Bidens cernua Calamagrostis canadensis Convolvulus sepium Cyperus strigosus Lythrum salicaria Polygonum amphibium stipulaceum Polygonum punctatum	2% 1% 6% 1% 3% 1% 2%
Plot	#2 (Northeast corner of Turnover	Plot)
s	Calamagrostis canadensis Convolvulus sepium Cyperus poeformis Galium tinctorium Lythrum salicaria Ludwigia palustris Rorippa islandica	5 % % % % % % % % % % % %
Plot	#3 (Center of Turnover Plot)	
	Cyperus odoratus Cyperus strigosus Galium tinctorium Juncus tenuis uniflorus Lindernia dubia Lythrum salicaria Mimulus alatus* (seedlings) Polygonum amphibium stipulaceum Ranunculus scleratus* Rorippa islandica Sparganium eurycarpum Verbena hastata*	23212 366 4066 2866 22866 2222 2222
Plot	#4 (Southwest corner of Turnover	Plot)
	Cardamine pennsylvanica Convolvulus sepium Cyperus odoratus* Eupatorium perfoliatum Lythrum salicaria	2% 3% 2% 10% 2%

Turnover Plot (continued) September 27, 1993

	Mimulus alatus* Ranunculus scleratus*				
Plot	#5 (Southeast Corner of Turnover	Plot)			
	Carex stricta Convolvulus sepium Cyperus odoratus* Eupatorium perfoliatum Leersia oryzoides Ludwigia palustris Mimulus alatus* Polygonum amphibium stipulaceum Polygonum punctatum				

Composition of ground-cover in 10' X 10' areas in the habitat of hairy puccoon on Presque Isle (S side of PA 832 east of the lighthouse) on 29 June 1993.

		Pe	rcent	age	of To	tal	Groun	d-Co	ver	
Taxon	1	1a	2	2a		3a			5	5 a
Bryophyta - Musci					1	4				
Equisetaceae					_					
Equisetum laevigatum			1							
Graminae										
Agropyron repens	•									2
Bromus tectorum						1				
Calamagrostis canadensis	40	25					4	-		
Dactylis glomerata					30	15				
Panicum virgatum				3		<1				
Poa compressa					30	5	2	7	1	2
Poa pratensis	- 1		10	5		5	2	5	1	4
Sorghastrum natans			30	1	2		<1		1	3
Cyperaceae										
Carex Muhlenbergii			4							
Myricaceae								_		
Myrica pensylvanica		<1					<1	2	3	
Polygonaceae						_				
Rumex acetosella	20			35	40	5	4	3	< 1	
Caryophyllaceae										
<u>Lychnis</u> <u>alba</u>	3									
Scleranthus annuus					•	1				
Saponaria officinalis		<1								
<u>Stellaria media</u>						<1				
Rosaceae										
Potentilla argentea					<1					
Potentilla recta			2.0	- ^	<1		0.5	0.5	c -	c 0
Rubus (flagellaris)?	90	90	80	50			85	95	6 5	60
Leguminosae										
Trifolium dubium					4					
Oxalidaceae										
Oxalis sp.					1					
Euphorbiaceae									5 0	20
Euphorbia cyparissias						•			50	30
Anacardiaceae		10	0.0	10			1	2	7	6
Toxicodendron radicans	1	10	20	10			1	4	'	O
Guttiferae				2						
Hypericum perforatum				2						
Asclepiadaceae		1								< 1
Asclepias syriaca		1								` 1
Convolvulaceae	1	•			<1					
Convolvulus arvensis	1				\1					
Scrophulariaceae	5									
Verbascum thapsus	9									
Plantaginaceae				5	30	15				
<u>Plantago lanceolata</u> Caprifoliaceae				Ū	00					
Lonicera Morrowi	1	2	1	1		•	<1	1		
Compositae		-	••	_				-		
Achillea millefolium	5									
Centaurea maculosa	J			20		2				
Erigeron annuus					1	10				
Taraxacum officinale					<1	<1				
Tragopogon pratensis					<1					
TIMPOPONOM PIGEMENTS										

Effects of mowing and soil turn-over on vegetation communities in the habitat of hairy puccoon (<u>Lithospermum caroliniense</u>) at Presque Isle.

Experimental Design

- Five pairs of 10' X 10' squares of habitat (adjacent to living puccoon plants) were marked on 29 June 1993 and the composition of ground-cover plant communities was determined.
- All ten squares were mowed to within 4" of the ground on 9 July 1993.
- The eastern-most square of each pair was rototilled to turn over the soil to an average depth of 3" on 15 July 1993.
- On the attached data table, the squares are numbered as they occurred from the east to west. Squares 1-5 were both moved and rototilled. Squares 1a-5a were only moved.

PRESOUE ISLE PUCCOON SITE SURVEY September 8, 1993

Composition of ground cover in 10' x 10' areas in the habitat of hairy puccoon on Presque Isle (S side of PA 832 east of the lighthouse) on September 8, 1993. Squares are numbered from east to west. Squares 1-5 were both mowed and roto-tilled and squares 1a-5a were mowed only. Percentage data for areas where Lonicera morrowi was removed in 1991 follow the five sets of quadrat data.

SURVEY SITES: #1 Turned-over 90% Bare ground 10% Calamagrostis canadensis Saponaria officinalis 5% Rubus flagellaris 4% Rumex acetocella Achillea millefolia 4왕 2% Setaria viridis 2% 1% Solanum carolinense 1% Asclepias syriaca Digitaria sanguinalis 18 Toxicodendron radicans 1% Oxalis stricta Rosa multiflora <1% <1% Cyperus schweinitzii <1% Panicum capillare <1% <1% Phytolacca americana #1a Mowed Bare ground 10% Calamagrostis canadensis Rubus flagellaris 5% Lonicera morrowi (seedlings) 5% 1% Sorghastrum natans 1% Toxicodendron radicans #2 turned-over 70% Bare ground 4% Panicum virgatum Rubus flagellaris 2% Solanum carolinense 28 Toxicodendron radicans 1% <1% Carex rugosperma <18 Equisetum laevigatum Schizachyrium scoparium

var. littorale

1 seedling in middle

	,
#2a mowed Bare ground Sporobolus cryptandrus Plantago lanceolata Sorghastrum nutans Panicum virgatum Rumex acetocella Oxalis stricta Rubus flabellaris Centaurea maculata Schizachyrium scoparium var. littoralis Oenothera biennis Poa compressa	10% 4% 2% 2% 2% (many seedlings) <1% 5% 3% 1% 1% 1% 4%
3 turned-over	
Bare ground Carpetweed follogo verticalla Digitaria sanguinalis Dactylis glomerata Plantago lanceolata Taraxacum officinale Calamagrostis canadensis Sporobolus cryptandrus Oxalis stricta Conyza canadensis Panicum digitaria Portulaca oleracea	45' 10% 3% 3% 3% 2% 1% 1% (6 plants) <1% <1% ?
#3a moved	
#3a mowed Bare ground	30%
Sporobolus cryptandrus	48
Conyza canadensis	4%
Dactylis glomerata	3%
Panicum virgatum Plantago lanceolata	2%
	2%
Schizachyrium scoparium	
var. littorale	2% 1%
Centaurea maculata Taraxacuma officinale	18 18
Rumex acetocella	1%
Digitaria sanguinalis	1%
Oxalis stricta	<1%
Euphorbia maculata	<1%

4 turned-over Bare ground Rubus flagellaris Rumex acetosella Calamagrostis canadensis Cyperus filiculmis	50% 4% 3% 2% <1%
Rubus flaqellaris Lonicera Morrowi Rumex acetosella Bare ground grass Panicum commonsianum Cyperus filiculmis Prunus serotina Myrica pensylvanica	80% 4% 4% 2% 2% 1% (2 plants) 1% <1% <1%
5 turned-over Bare ground Rubus flagellaris Euphorbia cyparissias Digitaria sanguinalis Sporobolus cryptandrus Mollugo verticillata Panicum virgatum Portulaca oleracea	90% 3% 2% 1% 1% <1% <1% <1%
Sa mowed Rubus flagellaris Panicum virgatum Euphorbia cyparissias Sporobolus cryptandrus Bare ground Ambrosia peilocacina Cyperus schweinitzii	25% 10% 5% 2.3? <1% (one plant) (one depauperate plant)

Eastern Lonicera morrowi "pull out site"

35 'E-W \times 25' N-S area cleared by park in 1991. Exotic plants hand weeded out by JKB and volunteers in early 1993.

Bare ground	40%	
Calamagrostis canadensis	5%	
Cyperus schweinitzii	5%	50 - 100 plants
Rumex acetocella	4%	_
Conyza canadensis	3 - 4 %	
Sporobolus cryptandrus	3%	20 plants
Carex blanda	3%	
Rubus occidentalis	3%	
Plantago lanceolata	2%	
Euphorbia maculata	2%	
Ambrosia artemisiifolia	2%	
Oxalis stricta	2%	
Panicum virgatum	2%	
Poa compressa	2%	
Euphorbia maculata	2%	
Asclepias syriaca	1%	
Digitaria sanguinalis	1%	
Gnaphalium obtusifolium	1%	
Oenothera biennis	1%	
Setaria viridis	1%	
Solanum carolinense	1%	
Sorghastrum netans	1%	N.
Rubus flagellaris	<1%	
Euphorbia cyparissias	<1%	
Physalis heterophylla	<1%	
Rhus typhina	<1%	
Verbena hastata	<18	

15' X 15'

Western $\underline{\text{Lonicera}}$ $\underline{\text{morrowi}}$ pull-out (shaded) - located at western end of study area

Cyperus filiculmis	5%	
Rubus flagellaris	3 %	
Poa compressa	3%	
Panicum commonsianum	28	(4 plants)
Carex rugosperma	2%	_
Cyperus schweinitzii	1%	(4 plants)
Lonicera morrowi	1%	(seedlings)
Carex blanda	1%	
Physalis heterophylla	<1%	•
Sporobolus cryptandrus	<1%	(1 plant)
Verbascum thapsus	?*	- .

